

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in view of the present amendment and in light of the following discussion, is respectfully requested.

Claims 1-3, 12, 15, 16, 18, 20, 22, 23, and 25-34 are pending. In the present amendment, Claims 1 and 12 are currently amended, Claim 14, 19, 21, and 24 are canceled without prejudice or disclaimer, and new Claims 26-34 are added. Support for the present amendment can be found in the original specification, for example, at page 19, lines 4-19, at page 25, line 3 to page 28, line 7, at page 29, lines 5-13, at page 31, line 14 to page 32, line 23, at page 33, lines 1-22, at page 35, line 17 to page 36, line 5, in Figures 1-6, and in Claims 1, 12, 15, and 16. Thus, it is respectfully submitted that no new matter is added.

In the outstanding Office Action, Claims 1-3, 12, 14-16, and 18-25 were objected to; Claim 1 was rejected under 35 U.S.C. § 102(e) as anticipated by, or under 35 U.S.C. § 103(a) as unpatentable over, Chen et al. (U.S. Publication No. 2005/0133059, hereinafter "Chen"); Claims 12 and 23-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Chen in view of Frankel et al. (U.S. Publication No. 2002/0073922, hereinafter "Frankel"); Claims 1 and 18-20 were rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya (U.S. Patent No. 6,068,729) in view of Cui et al. (U.S. Publication No. 2004/0000321, hereinafter "Cui"); Claims 12 and 23-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui, and in view of Frankel; Claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui, and further in view of Nakaune et al. (U.S. Publication No. 2001/0017190, hereinafter "Nakaune") and Bailey (U.S. Publication No. 2003/0047140); Claims 15 and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui and Frankel, and further in view of Nakaune and Bailey; Claim 14 was rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui and Frankel, and further in view of Ishikawa (U.S. Publication No.

2001/0031321) and Lee et al. (U.S. Publication No. 2002/0045966, hereinafter “Lee”); Claim 21 was rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui and Frankel, and further in view of Ishikawa; and Claim 22 was rejected under 35 U.S.C. § 103(a) as unpatentable over Shrotriya in view of Cui and Frankel, and further in view of Narwankar et al. (U.S. Publication No. 2001/0001175, hereinafter “Narwankar”).

Initially, regarding the objections to and rejections of Claim 14, 19, 21, and 24, it is noted that these claims are hereby canceled without prejudice or disclaimer. Thus, it is respectfully submitted that the objections to and rejections of these claims are moot and should be withdrawn.

Regarding the claim objections on page 2 of the Office Action, it is noted that the claims are hereby amended to clarify that the cleaning cycle occurs “within the process chamber in which the target substrate is not present.”¹ Thus, the claims are amended to clarify that the target substrate is not present during the cleaning cycle.

Additionally, the claims are amended to clarify that the cleaning cycle includes both a first period and a second period of cleaning the process chamber in an alternating manner.² Thus, the claims are amended to clarify that the alternative language refers to the order in which the first period and second period of cleaning are performed.

Accordingly, it is respectfully requested that the objections to the claims be withdrawn.

Regarding the claim observations on pages 2-4 of the Office Action, it is noted that the language “consisting essentially of” previously recited in independent Claims 1 and 12 is hereby amended to recite “consisting of.” This amendment is supported by the original specification, for example, at page 19, lines 4-19, at page 25, line 14 to page 28, line 2, and in the examples in which the first mixture gas only includes oxygen gas and argon gas and the

¹ See the original specification, for example, at page 25, lines 3-7 and at page 28, lines 4-7.

² See the original specification, for example, at page 19, lines 4-19.

second mixture gas only includes nitrogen gas and argon gas. Further, as these gases are gases that clean the process chamber, no other gases that have properties to clean the process chamber can be included.

Turning now to the rejections under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a), Applicants respectfully request reconsideration of these rejections and traverse these rejections, as discussed below.

As discussed above, amended Claim 1 recites performing a cleaning cycle in which a first period of cleaning and a second period of cleaning are alternatively performed. During the first period of cleaning, a first mixture gas consisting of oxygen gas and argon gas is supplied into the process chamber and a first plasma is generated from the first mixture gas. During the second period of cleaning, a second mixture gas consisting of nitrogen gas and argon gas is supplied into the process chamber and a second plasma is generated from the second mixture gas. Additionally, the process chamber cleaning method recited in Claim 1 **does not** comprises a period of cleaning the process chamber by use of a fluorine-containing compound.³

Regarding independent Claim 12, it is noted that Claim 12 is hereby amended to recite a method for performing a nitriding process on a target substrate. A method claim similar to Claim 12, but reciting an oxidizing process is added as independent Claim 28. Further, Claim 12 is amended in a manner similar to that discussed above with respect to Claim 1.

It is respectfully submitted that the cited references do not disclose or suggest every feature recited in amended independent Claims 1 and 12.

Regarding the rejection of Claim 1 as anticipated by or unpatentable over Chen, the Office Action, relies on paragraphs [0025] and [0026] of Chen in support of the position that

³ See the original specification, for example, at page 29, lines 4-13.

nitrogen may be contained in argon-based plasma (second cleaning) used after oxygen and argon plasma (first cleaning) in Chen. However, these paragraphs do not mention nitrogen as being positively supplied as part of the cleaning gas but mention it as a residue. Thus, the nitrogen described in Chen is not part of the cleaning gas, but is instead residue from the deposition process that is to be removed by the cleaning gas.

Further, Chen describes an NF_3 plasma treatment as part of the cleaning process. As discussed above, the method recited in Claim 1 cleans the process chamber by utilizing oxygen radicals and nitrogen radicals without using a fluorine-containing compound, which is corrosive.

Accordingly, Claim 1 clearly includes claim elements concerning supply of the first and second mixture gases that patentably define over Chen. Thus, it is respectfully requested that the rejections of Claim 1 based on Chen be withdrawn.

Regarding the rejection of Claims 12 and 23-25 as unpatentable over Chen in view of Frankel, it is noted that Claim 12 also recites that the second cleaning includes nitrogen and that a fluorine-containing compound is not used inside the cleaning cycle or between the cleaning cycle and the nitriding process.

Further, Frankel does not cure the above-noted deficiencies of Chen. Instead, Frankel is relied on to teach “the use of a pre-deposition seasoning process.” However, as noted in the Office Action on page 6, the seasoning of Frankel is arranged to use TEOS and ozone. Thus, the seasoning recited in Claim 12, which uses the second mixture gas consisting of nitrogen gas and argon gas, is not the seasoning of Frankel.

Accordingly, it is respectfully submitted that the cited combination of Chen in view of Frankel does not disclose or suggest every feature recited in Claim 12. Thus, it is respectfully requested that the rejection of Claim 12, and Claims 23 and 25 which depend thereon, based on Chen in view of Frankel be withdrawn.

Regarding the rejection of Claims 1 and 18-20 as unpatentable over Shrotriya in view of Cui, it is noted that Shrotriya describes a technique for performing cleaning by use of gases containing an oxygen atom or a nitrogen atom. Further, Cui describes a technique for performing cleaning by use of gases containing argon gas. However, the cleaning processes described in each of the references uses a corrosive compound (such as a fluorine-containing compound) as a main part of the gas for cleaning. As discussed above, the cleaning cycle recited in Claim 1 includes a first mixture gas consisting of oxygen gas and argon gas and a second mixture gas consisting of nitrogen gas and argon gas, and a fluorine-containing compound is not used as part of the cleaning cycle.

Accordingly, the method recited in Claim 1 is believed to patentably define over Shrotriya in view of Cui. Thus, it is respectfully requested that the rejection of Claim 1, and Claims 18 and 20 which depend thereon, as unpatentable over Shrotriya in view of Cui be withdrawn.

Regarding the rejection of Claims 12 and 23-25 as unpatentable over Shrotriya in view of Cui and Frankel, it is noted that Claim 12 is believed to patentably define over Shrotriya in view of Cui for at least the reasons discussed above with respect to Claim 1. Further, it is respectfully submitted that Frankel does not cure the above-noted deficiencies of Shrotriya in view of Cui. Accordingly, it is respectfully requested that the rejection of Claims 12 and 23-25 as unpatentable over Shrotriya in view of Cui and Frankel be withdrawn.

Regarding the rejections of Claims 2, 3, 14-16, 21, and 22, it is noted that Claims 2 and 3 are dependent on Claim 1, Claims 15, 16, and 22 are dependent on Claim 12, and Claims 14 and 21 are canceled as discussed above. Accordingly, Claims 2, 3, 15, 16, and 22 are believed to be patentable for at least the reasons discussed above with respect to Claims 1 and 12. Additionally, it is respectfully submitted that the remaining secondary references

(Nakaune, Bailey, Ishikawa, Lee, and Narwankar) do not cure the above-noted deficiencies with respect to the cited combinations of Shrotriya, Cui, and Frankel. Thus, it is respectfully requested that the rejection of Claims 2, 3, 15, 16, and 22 be withdrawn.

New Claims 26-34 are added by the present amendment. Support for Claims 26-34 can be found in the original specification, for example, at page 19, lines 4-19, at page 25, line 3 to page 28, line 7, at page 29, lines 5-13, at page 31, line 14 to page 32, line 23, at page 33, lines 1-22, at page 35, line 17 to page 36, line 5, in Figures 1-6, and in Claims 1, 12, 15, and 16. Thus, it is respectfully submitted that no new matter is added.

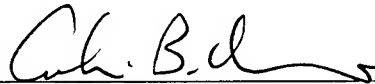
New Claims 26 and 27 depend on independent Claims 1 and 12. Therefore, it is respectfully submitted that new Claims 26 and 27 patentably define over the cited references for at least the reasons discussed above with respect to Claims 1 and 12.

Further, new independent Claim 28 recites features similar to those discussed above with respect to Claim 12. Accordingly, it is respectfully submitted that Claim 28, and Claims 29-34 which depend thereon, patentably define over the cited references for at least the reasons discussed above with respect to Claim 12.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. A Notice of Allowance is earnestly solicited.

Respectfully submitted,

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